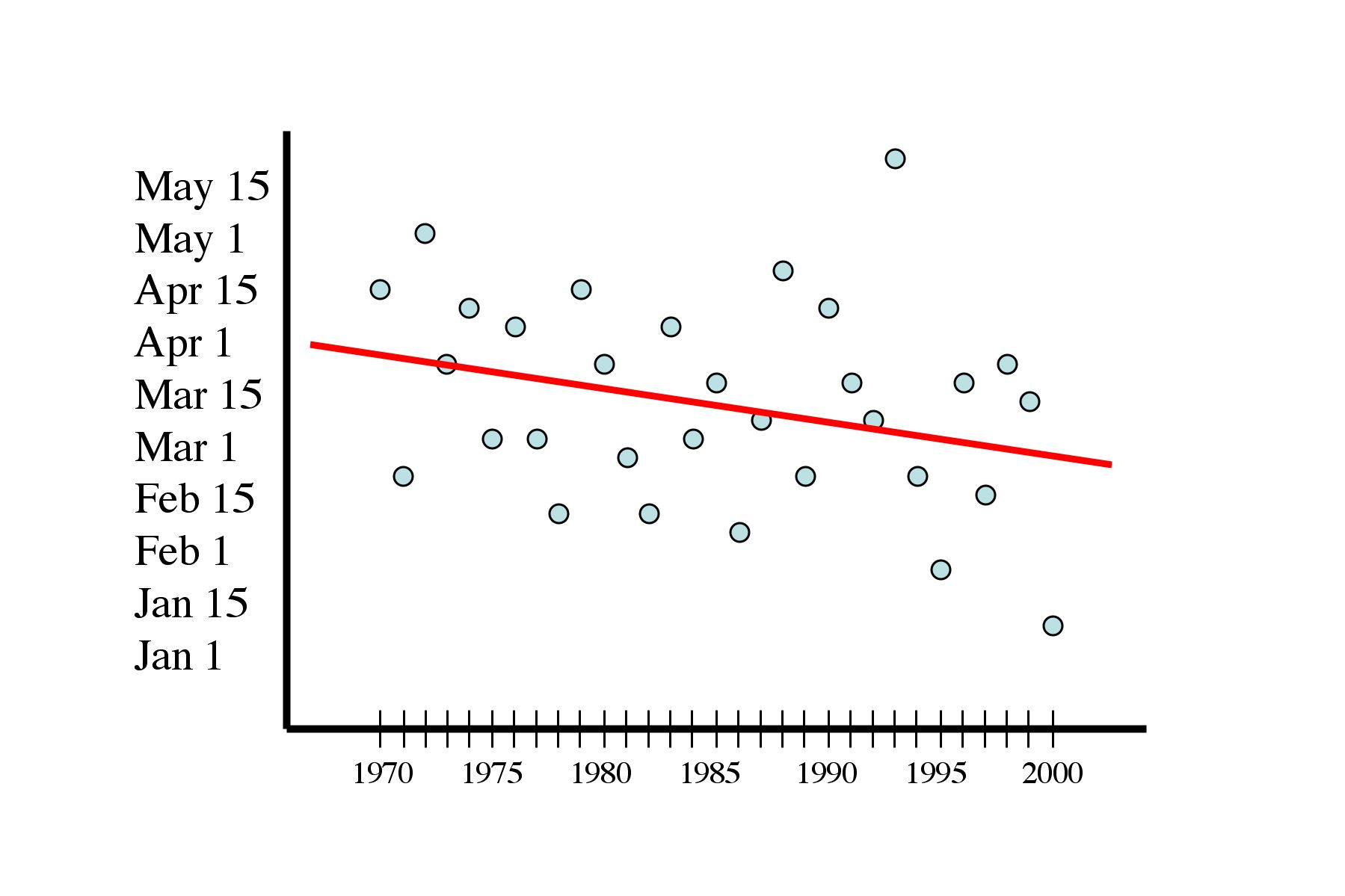
**Butterfly Phenology Activity**

This worksheet is based on the educational activity of Art Shapiro’s butterfly site (<http://butterfly.ucdavis.edu/>). Please look briefly over the website and the activity introduction (<http://butterfly.ucdavis.edu/education/stat2/intro>). Then select a species from the “Activity Data” page (<http://butterfly.ucdavis.edu/education/stat2/data>).

**I. Butterfly phenology**

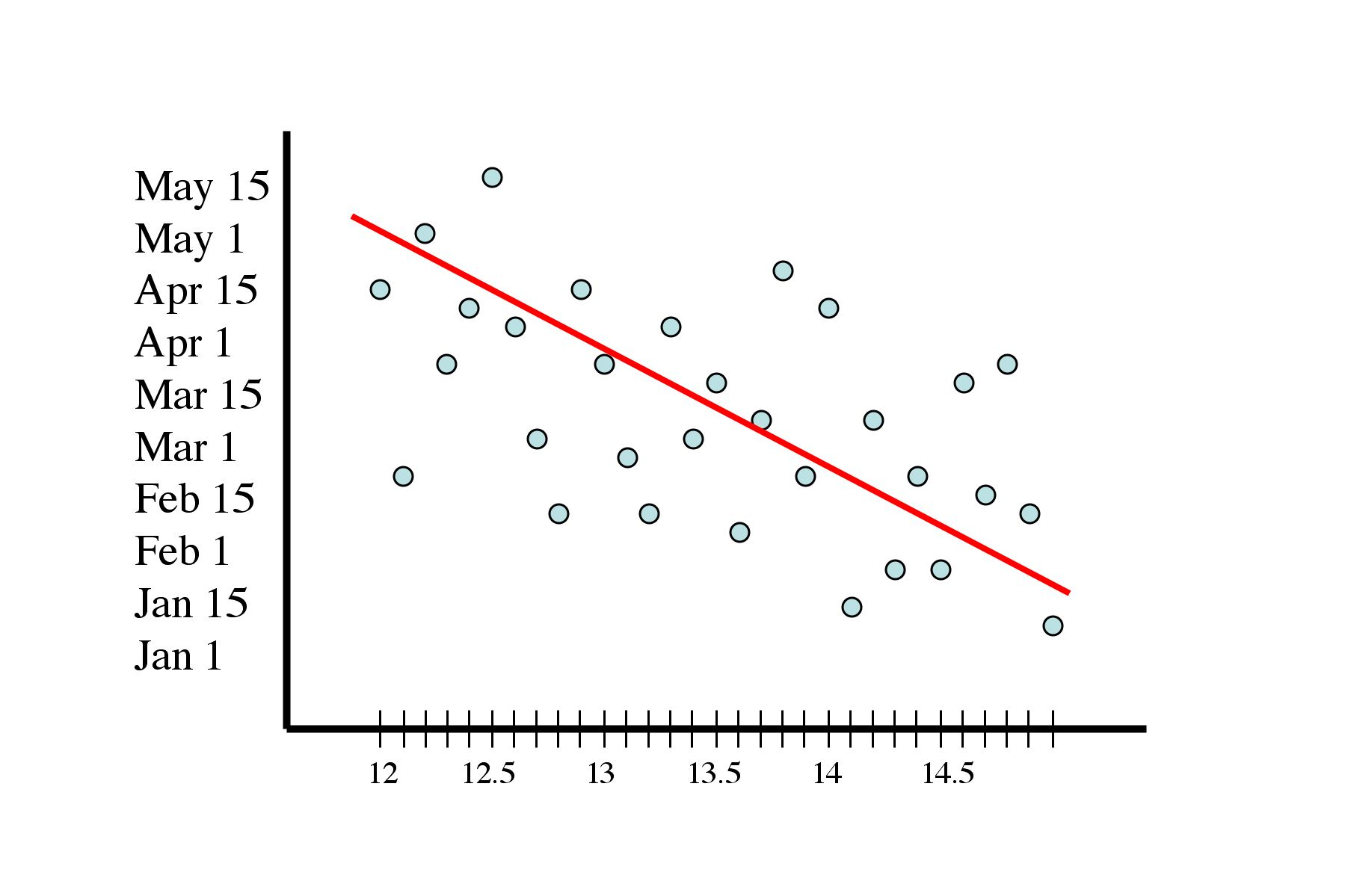
Make a graph of the dates of first spring flight versus years for your chosen species.  This will be set up much like the graph to the left, with the exception that the y-axis will be numbers not dates for the reasons discussed on the activity page.

*Questions:*

1. Has your butterfly been emerging earlier or later (or neither) over the years in which observations were made?
   * 1. **Weather patterns**

Make a graph with years on the x axis and weather observations on the y axis for two different weather variables.

*Questions:*

1. Have there been trends in your two weather variables over time? Do you detect any potential relationship between trends in the two weather variables?
2. **Phenology and weather**

Make a graph relating date of first flight to each of your weather variables. The two graphs will be much like that to the left, but please label your X axis.

*Questions:*

1. What have you learned about the relationship between climate and the butterfly species?
2. Why do you think a butterfly species would be influenced by the climatic variable you studied?

**IV. Comparison between species**

Please look over other students’ plots and answer the following questions:

*Questions:*

1. Are there any phenological patterns that are common to a large number of species?  
   For example, are more of the species emerging earlier through time or later, or neither?
2. Are there any common patterns in the way species respond to the climatic variables?  
   For example, does winter rainfall affect the first spring flight of all the butterfly species in the same way?
3. Review the biology of the butterfly species that you picked, and consider how it is different from other species. What are some biological properties that could explain why one species responds in a certain way to weather while another species responds in a different way?
4. You have looked at three kinds of patterns: (1) trends through time in butterfly phenology, (2) trends through time in weather data, and (3) the relationship between butterfly phenology and climate. Does the behavior of the butterfly (the phenological pattern) make sense in light of what you learned about the weather and about the influence of weather on your particular species?